MODULAR TYPE INSTRUMENT PANEL

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Filed Feb. 29, 1968, Ser. No. 709,452

Int. Cl. H02b 1/08, 9/00, 1/04

U.S. Cl. 317—120

11 Claims

ABSTRACT OF THE DISCLOSURE

The modular type instrument panel comprises a housing having sides, top and bottom and end walls screw fastened one to the other so that the screw heads are exposed only within the housing. A mounting plate is secured adjacent the top of the housing and has a plurality of spaced openings providing access within the housing. An electrical circuit board is mounted within the housing opposite the mounting plate. Instruments are inserted into the openings and have prongs extending from their rear faces for making electrical contact with the circuit board. The contacts on the circuit board are configured so that the instruments are interchangeable for insertion through any one of the openings. A face plate is locked to the housing and overlies the faces of the instruments to lock the housing to the vehicle. The face plate covering the exposed screw heads whereby the housing is tamperproof and cannot be disassembled by unauthorized personnel.

BACKGROUND OF THE INVENTION

The present invention relates to an instrument panel and particularly relates to a modular type tamperproof instrument panel for vehicle use.

Instruments and controls, such as oil pressure gauges, water temperature gauges, ignition switches, ammeters, engine hourmeters, fuel gauges, speedometers, odometers, etc., are almost always mounted in openings formed through a panel, normally the dash, mounted on a vehicle in close proximity to the operator of the vehicle. Such instruments are normally mounted to a housing and electrically connected behind the dash to electrical lead wires connected to the sensing units. To accomplish this, access behind the dash is usually required. In most vehicle installations such access is provided by going under the dash or through adjacent openings in the dash which makes it difficult to effectively employ the tools, such as screwdrivers, necessary to mount and connect the instruments in the limited confines behind the dash. Thus, mounting and electrically connecting the instruments is a time consuming, laborious, awkward, and expensive task.

Additionally, this type of mounting is subject to tampering by unauthorized personnel. For example, in many applications, it is desirable to accurately record the elapsed time of engine operation for warranty purposes, servicing, providing a basis for rental fees, etc. In the foregoing instrument mounting, the electrical connections for the engine hourmeter could be easily disconnected or the meter itself removed, whereby the engine could be operated without the time of operation being recorded.

In certain instances, instruments have been mounted in containers which, in turn, are secured to a vehicle with the lead in electrical connections from the vehicle sensing units being connected to the rear of the container. While this type of container provides pre-wired instruments, the contacts for which open through the rear face of the container, it is still possible to disconnect the electrical connection at the rear of the container and accordingly these containers are not tamperproof. Moreover, in this type of instrument mounting, the instruments or meters per se are usually not of the plug-in type or removable individually from the container and if a malfunction occurs in any one meter, it is necessary to replace the entire instrument container. In those containers where individual plug-in type meters are provided, the container and meters are usually formed to permit ready withdrawal of the meters through the front face of the container. This, of course, permits electrical disconnection of the meters by unauthorized personnel.

Additionally, it is not uncommon that, in assembling and installing the instrument panel, the electrical connections for the individual meters are incorrectly wired. In such situations, the instrument panel must be completely disassembled and rewired and this, of course, is a time consuming and expensive operation. Moreover, in those panels which employ plug-in meters, it is possible that the meters may be plugged into the wrong socket with the result that the meter is overloaded or otherwise damaged and requires replacement.

SUMMARY OF THE PRESENT INVENTION

The modular type instrument panel hereof comprises a housing having side, top and bottom, and end walls secured one to the other by screws, the heads of which are exposed wholly within the housing. A mounting plate is provided adjacent the top wall and has a plurality of spaced openings providing access into the housing and through which plug-in type meters or instruments may be inserted. The opposite bottom wall of the housing mounts a circuit board having an insulator panel disposed between parallel lead wires which extend the full length of the housing opposite the openings through the mounting plate. Groups of like perforations through the insulator panel are disposed in registry with the openings through the mounting plate. In this manner, meters or instruments may be inserted through the openings, and contact prongs mounted on the rear faces of the meters extend through selected perforations for electrical connection with the lead wires on the other side of the insulator panel. By forming a like group of perforations in registry with each opening, the meters may be interchangeably inserted through any one of the openings with the assurance that proper electrical connection will be made with lead wires connected to the appropriate sensing unit. A face plate having spaced openings corresponding to the openings through the mounting plate is mounted to bear against rim portions of the outer faces of the meters. The face plate overlies the exposed heads of the screws which maintain the housing assembled and is locked to the housing by a lock and key arrangement whereby the housing is tamperproof and cannot be unauthorizedly disassembled without the key.

A cannon plug is formed in the end wall of the housing and connects with the lead wires within the housing. The cannon plug carries an inwardly projecting tab and...
the inner end of a rod disposed wholly within the hous- ing is slidably received within an opening formed through the tab to lock the plug to the housing to prevent elec- trical disconnection. The other end of the rod extends outwardly of the mounting plate. When the face plate is locked to the housing, the rod is axially inwardly dis- placed to maintain the inner end thereof engaged through the opening in the tab whereby the face plate must be removed before the cannon plug and hence the electrical connection to the instrument panel can be removed. The instruments are clamped between the mounting plate and the face plate by an elastic gasket whereby the hous- ing is weatherproofed and the instruments mounted to re- sist shock and vibration.

 Accordingly, it is a primary object of the present in- vention to provide an improved modular type instru- ment panel.

 It is another object of the present invention to pro- vide a tamperproof modular type instrument panel.

 It is yet another object of the present invention to pro-vide a modular type instrument panel wherein the instru- ments are of the plug-in type and interchangeable for insertion through and mounting in any one of the opened formed in the panel.

 It is still another object of the present invention to pro-vide a modular type instrument panel having an exter- nal electrical connection therefor which is locked to the panel housing and cannot be disassembled without disassembly of the housing.

 It is a further object of the present invention to pro- vide a modular type instrument panel having plug-in in- struments in combination with a unique locking appa- ratus whereby the instruments may be removed only by authorized personnel.

 It is still a further object of the present invention to pro- vide a modular type instrument panel wherein the meters are mounted in the housing on shock and weather- proof mountings.

 It is yet a further object of the present invention to pro- vide a modular type instrument panel wherein the housing can be readily, easily and inexpensively con- structed, wherein defective meters can be rapidly re- placed, and wherein the housing can be mounted in any orientation such as, for example, inverted or on its side. These and further objects and advantages of the present invention will become more apparent upon reference to the following specification, claims and appended drawings.

 DESCRIPTION OF THE DRAWING FIGURES

 FIGURE 1 is a fragmented perspective view of a ve- hicle mounting a modular type instrument panel con- structed in accordance with the present invention;

 FIGURE 2 is a plan view of the instrument panel look- ing at the dial faces thereof and with portions broken out for ease of illustration;

 FIGURE 3 is a longitudinal cross sectional view there- of taken about on line 3—3 in FIGURE 2;

 FIGURE 4 is a horizontal sectional view thereof taken about on line 4—4 in FIGURE 3;

 FIGURE 5 is a cross sectional view thereof taken about on line 5—5 in FIGURE 3;

 FIGURE 6 is a cross sectional view thereof taken about on line 6—6 in FIGURE 3;

 FIGURE 7 is a perspective view of a plug-in type instru- ment panel employed with the instrument panel hereof; and

 FIGURE 8 is a fragmented perspective view of the electrical plug connection for the instrument panel hereof.

 DESCRIPTION OF THE PREFERRED EMBODIMENT

 Referring to the drawings and particularly to FIG- URE 1, there is shown a portion of a vehicle, generally indicated at 10, mounting the instrument panel, gen- erally indicated at 12, of the present invention. The in- strument panel 12 may be mounted in or on any type of vehicle and finds most common use in off-road ve- hicles, such as for example tractors, earth movers, and the like. Accordingly, the normally open cab portion of such a vehicle is illustrated and comprises a seat 14, steering wheel 16, and vehicle controls 18, instrument panel 12 being mounted forwardly of wheel 16 by a pair of angle brackets 20 suitably fixed at opposite ends to the vehicle 10 and the ends of panel 12. Panel 12 is thus positioned directly in front of the vehicle operator with the dial faces of the instruments to be described facing the operator.

 Panel 12 comprises a generally rectangular housing having a pair of side walls 24, a bottom wall 26 and end walls 28 and 30. As seen in FIGURE 3, end walls 28 and 30 are fixed to bottom wall 26 by pairs of screws 32 which engage through angle brackets 34 and screw thread into the inner faces of the respective end walls 28 and 30 and the bottom wall 26. Side walls 24 are likewise fixed to end and bottom walls 28, 30 and 26 as by simi- larly fastened angle brackets, not shown. A rectangular instrument mounting plate 38 is inset from the upper edges of side and end walls 24, 28 and 30 within hous- ing 22 and fastened at opposite ends to end walls 28 and 30 by angle brackets 40 which are secured by screws 42 to the upper face of mounting plate 38 and the inner faces of end walls 28 and 30. In this manner, all of the fasteners maintaining the housing 22 in assembled relation are disposed wholly within the confines of housing 22 and accessible for disassembling housing 22 only after an upper face plate 44 is removed, face plate 44 releasably closing the top portion of the housing as will be de- scribed. It will be appreciated that an epoxy can be em- ployed in lieu of the angle brackets and screws for fasten- ing the parts forming the housing one to the other. Also, side walls 24, bottom wall 26 and plate 38 could be formed of a plastic extrusion.

 A plurality of longitudinally spaced circular openings 46 are formed through mounting plate 38 and are of such size as to receive the cylindrical body portions of various instruments or meters generally indicated at 48. An indicated previously, meters 48 may be any conven- tional electrically operated instrument for measuring engine parameters, such as oil pressure, water tempera- ture, oil temperature, etc., or other parameters, such as odometers, engine hourmeters, etc. The instruments may also comprise lamps, not shown, for signaling purposes, such as low oil pressure and the like, or an ignition switch, not shown, and it is to be understood that the term instru- ments is used herein generally to include measuring meters, indicating lamps, switches, and the like. Instru- ments 48 are of a commercially available type having cylindrical body portions and those instruments illus- trated are those of the gage or measuring type for moni- toring vehicle performance and are provided with dis- play faces 50. The inner faces of the cylindrical body portions of these conventional meters 48 each have a pair of contacts, not shown, and the meters hereof are modified only to the extent that a pair of electrically con- ductive prongs 52 are suitably secured to the inner face of meters 48 as by screws 54 (FIGURE 7). Prongs 52 are in electrical contact with the pair of contacts on the rear face of meters 48 and are of such a length as to extend from meters 48 to adjacent the bottom wall 26 of panel 12 for purposes as will become clear. The outer end or front body portion of each meter 48 is en- compassed by and attached to a meter frame 56 which is cut along diametrically opposed chord lines thereof as at 58 (FIGURE 2) so that the meter 48 is readily in- serted through an opening 46 with the chordwise cut portions 58 bearing against the inner faces of side walls 24.

 A pair of inwardly opening channel members 60 are suitably secured along the inner faces of side walls 24 with the lower flanges thereof bearing against bottom wall 26. A rectangular circuit board 62 is slidably re-
ceived between channel members 60 along the bottom of housing 22 and has a plurality of electrical lead wires 64 coextensive therewith and lying in spaced parallel side-by-side relation. Lead wires 64 are connected to the various vehicle sensing units by a cannon plug 70 to be described. As seen in FIGURE 4, a circuit board 62 extends substantially the full length of housing 22 and accordingly lies in spaced register opposite openings 46.

Groups of similarly spaced and arranged perforations 66 are formed through the upper surface of circuit board 62 to provide instrument connecting stations in registry below openings 46 and open through board 62 to expose the upper surface of wires 64. The perforations in each group 66 consequently form a corresponding pair of lead wires 64 electrically connected to the associated sensing unit. Thus, by spacing the prongs 52 on and about the base of each instrument 48 in such a manner as to engage through a selected pair of perforations 66 for electrical connection with an associated pair of wires 64, electrical connection with lead wires 64 broken unless the danger of making improper electrical contact with lead wires associated with the other sensing units.

It is a significant feature hereof that instrument 48 may be interchangeably mounted through the various openings 46. To accomplish this, identical patterns of preferably asymmetrical perforations 66 are provided at each instrument connection station and the prongs 52 of the various types of instruments are spaced on and about the base of such instruments differently one from the other so that the prongs for each type of instrument engage through like arranged perforations 66 in circuit board 62 to make electrical contact with the pairs of lead wires 64 connected to the associated sensing unit.

In this manner, any of the instruments 48 may be inserted in any of the openings 46 with the assurance that the prongs 52 thereof will engage through the selected perforations electrical contact with the pairs of wires 64 associated with corresponding sensing units.

It is thus seen that when panel 12 is properly wired and the prongs 52 of the various instruments properly configured for electrical contact with their associated wires 64, any desired arrangement of the instruments along the panel may be obtained with each meter matching only one pair of holes in the asymmetric perforation patterns. Additionally, whenever an instrument is defective, the defective instrument may be withdrawn from housing 22 and a new instrument plugged through its opening 46 without necessitating manual electrical connection of the instrument to the lead wires, electrical connection being made when the new instrument is fully seated in its opening 46.

To electrically connect instruments 48 to the associated sensing units, not shown, an opening is provided through the lower portion of end wall 30 as at 68 and a multi-pin plug (FIGURE 8) receives and makes electrical contact with the terminal ends of lead wires 64. Plug 70 connects via a suitable cable 74 with the sensing units, not shown, usually through the fire wall of the vehicle. It is a significant feature hereof that cannon plug 70 cannot be disconnected from housing 22 and its electrical connection 76 broken unless access within housing 22 can be obtained through removal of face plate 44 as will be described. As seen in FIGURES 3 and 8, when plug 70 is properly secured to panel 12, access through opening 68 is precluded. To this end, the inner base portion 74 of plug 70 fits snugly within opening 68 and an outer enlarged flange 76 is formed to butt against the outer face of end wall 30. A tab 78 projects inwardly from flange 76 through opening 68 and overlies panel 62. An aperture 80 is formed through tab 78 and a recess 82 is formed in the underlying surface of panel 62 in registry with aperture 80.

A vertically extending pin 84 is slidably received through an end portion of mounting plate 38 as seen in FIGURE 3 and the lower end of pin 84 engages through aperture 80 and into recess 82 whereby plug 70 is locked to housing 22 and cannot be withdrawn therefrom.

A flange 86 is formed about pin 84 adjacent the lower end thereof and a spring 88 encompasses the lower end of pin 84 engaging between flange 86 and the upper surface of panel 62 whereby pin 84 is biased upwardly in a direction to release tab 78. When pin 84 is in the illustrated cannon plug locking position, the upper end thereof lies flush with the upper surface of mounting plate 38. The undersurface of gasket 56 bears against the upper end of pin 84 maintaining pin 84 in the illustrated locking position against the bias of spring 88. It will be seen that gaskets 56 of instruments 48 are clamped between mounting plate 38 and face plate 44 in a manner as will presently become more clear when it is maintained in the locking position and is released for biased movement to an unlocking position only upon removal of face plate 44 and withdrawal of the first instrument 48.

Face plate 44 comprises a rectangular plate having a plurality of openings 90 longitudinally spaced to register with the dial faces 59 when plate 44 is secured to housing 22. It will be noted that the diameter of openings 90 is less than the diameter of gaskets 56 whereby plate 44 overlies gaskets 56 clamping the same against mounting plate 38 and thus maintaining instruments 48 within housing 22. To lock plate 44 to housing 22, a transverse groove 92 is formed across the upper inner face of end wall 30 and the squared end of plate 44 is slidably received therein. The opposite end edge of plate 44 is beveled for engagement against a like beveled upper edge of opposite end wall 28.

The opening 90 through plate 44 next adjacent end wall 28 mounts an inwardly extending sleeve 94 which is closed at its inner end by a lock 96. Lock 96 is laterally offset from the axis of sleeve 94. A laterally extending lever arm 98 is formed on the inner end of the lock 96 and is rotated in response to turning the key 100 in lock 96 between locking and unlocking positions. When lever arm 98 is turned to the locking position as illustrated, the tip 102 of the lever projects beyond the cylindrical confines of sleeve 94 and bears against a projection 104 on the undersurface of mounting plate 38 whereby sleeve 94 cannot be withdrawn through opening 46. Thus, the locking action of the end edge of plate 44 within groove 92 and lever 98 against projection 104 at the opposite end of plate 44 preclude removal of face plate 44, thereby locking instruments 48 within housing 22 and preventing unauthorized removal thereof. A closure cap 106 is suitably retained in the opening 90. In order to remove face plate 44 and thereby release instruments 48 so that the same may be removed from housing 22, a closure cap 106 is removed and lock 96 is turned by key 100 to rotate lever arm 98 from the illustrated locking position approximately 90 degrees so that tip 102 lies within the cylindrical confines of sleeve 94. Sleeve 94 may thus be withdrawn through opening 46 and the opposite end edge of plate 44 may be slid longitudinally out of groove 92 whereby face plate 44 can be removed from housing 22. Note that the housing, when fully assembled and locked, is substantially weatherproof and that internal and/or external spray coatings of sealant material may
be applied to enhance the weatherproof characteristic of the panel.

It is thus seen that the objects of the invention are fully accomplished in that there has been provided a modular type instrument panel which is tamperproof. It is seen that there are no external fasteners which may be loosened, unthreaded or otherwise removed to obtain access into housing 22 and only authorized personnel having key 100 are able to remove face plate 44 by unlocking lock 96 whereby instruments 48 may be removed and access within housing 22 obtained. It is also seen that there is provided a modular type instrument panel having plug-in type instruments which are automatically connected with the proper lead wire upon full insertion of the instruments into the housing 22. No manual wiring is required and proper electrical connection is always assured as prongs 52 are configured to make electrical contact with the appropriate lead wire 64 through the selected perforations in panel 62.

With such a panel wherein the plug-in type instruments may be interchangeably mounted through any of the openings along the panel with the assurance that proper electrical connection with the lead wires associated with the particular instrument will always be made. This is accomplished by providing groups of like arranged perforations in registry with the openings through the panel whereby the prongs of the instruments engage through selected registering perforations for connection with the proper associated lead wires. It is also a significant feature that the external electrical connection providing the input to the instrument panel cannot be disconnected from the panel without first removing the face plate 44. In this manner, electrical connection to the instruments is always maintained and unauthorized disconnection precluded.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. For use in vehicles or the like, a tamperproof modular type instrument panel comprising a closed housing, a mounting plate carried by said housing and having a plurality of spaced openings formed therein providing access to said housing, electrical circuit means within said housing having circuit connections including groups of similarly arranged electrical contacts in spaced registry with said plate openings, means external to said housing connected to said circuit means and adapted for connection to a source of electrical signals, a plurality of instruments positioned in said opening, means on the inner end of said instruments and within the housing for electrically connecting said instruments to circuit means, and releasably locking said instruments to said housing.

2. For use in vehicles or the like, a tamperproof modular type instrument panel comprising a closed housing, a mounting plate carried by said housing and having a plurality of spaced openings formed therein providing access to said housing, electrical circuit means within said housing and including a circuitboard having groups of similarly arranged electrical contacts, each group of contacts lying in spaced registry with a plate opening, means external to said housing connected to said circuit means and adapted for connection to a source of electrical signals, a plurality of instruments positioned in said opening, means on the inner end of said instruments and within said housing for electrically connecting said instruments to circuit means, and releasably locking said instruments to said housing.

3. For use in vehicles or the like, a tamperproof modular type instrument panel comprising a closed housing, a mounting plate carried by said housing and having a plurality of spaced openings formed therein providing access to said housing, electrical circuit means within said housing and having circuit connections in registry with said openings, means external to said housing connected to said circuit means and adapted for connection to a source of electrical signals, a plurality of instruments positioned in said opening, means on the inner end of said instruments and within said housing for electrically connecting said instruments to circuit means, and releasably locking said instruments to said housing.

4. An instrument panel according to claim 2 wherein said circuit board comprises a plurality of lead wires extending in spaced side-by-side relation substantially parallel one to the other and a non-conductive board overlying said wires, said wires being coextensive with said board, said non-conductive board having spaced groups of similarly arranged openings in overlying registry with said wires, said pair of instrument contacts including a pair of prongs engaging through a selected pair of said openings for electrical contact with a predetermined pair of wires.

5. An instrument panel according to claim 3 wherein said plug locking means comprises a locking tab, a pin mounted for axial movement and engageable with said tab to lock said plug to said housing, said pin being releasable from locking engagement with said tab in response to release of said instrument locking means.

6. An instrument panel according to claim 5 including means biasing said pin for axial movement to a plug release position.

7. An instrument panel according to claim 1 wherein said instrument locking means comprises a face plate having a plurality of spaced openings formed therethrough in registry with the openings formed through said mounting plate, and including a lock for releasably coupling said face plate to said housing and maintaining said face plate in overlying relation to said mounting plate.

8. An instrument panel according to claim 7 wherein said instruments have rim portions formed of an elastic material, said rim portions having a diameter greater than the diameter of the openings through said face and mounting plates, said face plate bearing against said rim portions and clamping said rim portions between said face plate and mounting plate thereby preventing release of said instruments.

9. An instrument panel according to claim 1 wherein said housing includes a plurality of wall parts forming a container, fastening means comprising said wall parts in assembled relation forming a container, said fastening means lying wholly within said housing and accessible only from within said housing.

10. An instrument panel according to claim 1 wherein said housing includes side, end and bottom walls and fastening means connecting said side, end and bottom walls in assembled relation forming a generally rectangular container, said locking means comprising a face
plate overlying said instruments and closing said housing on the side thereof opposite said bottom wall, said fastening means lying wholly within said housing and accessible only from within said housing.

11. An instrument panel according to claim 10 wherein said mounting plate is inset from the edges of said side and end walls, said face plate having a plurality of openings in registry with the openings in said mounting plate, said instruments including rim portions having diameters greater than the diameters of the openings in said face plate and mounting plates, said face plate overlying said rims to clamp the same between said face and mounting plates whereby said instruments are locked within said housing.